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# THE WANING HARDWOOD SUPPLY

## AND THE APPALACHIAN FORESTS.

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# THE WANING HARDWOOD SUPPLY.

### HARDWOOD CUT DECLINING.

The hardwood lumber cut in 1899, according to the census,[a] was 8,634,021 thousand feet; in 1906 it had fallen to 7,315,491 thousand feet, a decrease of 15.3 per cent.

This decrease took place during a period when American industries sprang forward at a pace unparalleled; when there was the strongest demand ever known for every class of structural material; when the output of pig iron increased 15 per cent, that of cement 132.17 per cent, and even that of softwood timber 15.6 per cent.

That the decrease is due to diminished supply rather than to lessened demand seems to be proved beyond question. During the same period the wholesale price of various classes of hardwood lumber advanced from 25 to 65 per cent; every kind of hardwood found in quantity sufficient to make it useful has been put on the market, and hardwood timber is now being cut in every State and every locality where it exists in quantity large enough to be cut with profit. These conditions could not prevail were the decrease in production due to a falling off in demand.

### CONDITION AS SHOWN BY KIND OF TIMBER.

The most notable shrinkage has been in the leading hardwoods to which the public has been long accustomed.

Oak, which in 1899 furnished over half the entire output of hardwood lumber, fell off 36.5 per cent. Yellow poplar, which in 1899 was second among hardwoods in quantity produced, fell off 37.9 per cent. Elm, the great standard in slack cooperage, went down 50.8 per cent. Cottonwood and ash, largely used in many industries, lost, respectively, 36.4 and 20.3 per cent.

A complete comparison of output for the fifteen leading hardwoods is given in Table 1.

[a] The cut of 1899 was reported in the census of 1900. The reports for the years 1904 and 1905 are available, but are less complete, and are, therefore, not quite comparable with the above figures. In each case the figures for those years fall below those for 1906. Acknowledgment is made to the Bureau of the Census for other figures used in this report.

TABLE 1.—*The cut of hardwood lumber, by kinds, 1899–1906.*

| Wood. | 1899. Thousand feet. | 1906. Thousand feet. | Per cent increase (+) or decrease (−). |
|---|---|---|---|
| Oak | 4,438,027 | 2,820,393 | − 36.5 |
| Maple | 633,466 | 882,878 | + 39.4 |
| Poplar | 1,115,242 | 693,076 | − 37.9 |
| Red gum | 285,417 | 453,678 | + 59.0 |
| Chestnut | 206,688 | 407,379 | + 97.1 |
| Basswood | 308,069 | 376,838 | + 22.3 |
| Birch | 132,601 | 370,432 | +179.4 |
| Cottonwood | 415,124 | 263,996 | − 36.4 |
| Beech | (a) | 275,661 | ..... |
| Elm | 456,731 | 224,795 | − 50.8 |
| Ash | 269,120 | 214,460 | − 20.3 |
| Hickory | 96,636 | 148,212 | + 53.4 |
| Tupelo | (a) | 47,882 | ..... |
| Walnut | 38,681 | 48,174 | + 24.5 |
| Sycamore | 29,715 | ..... | ..... |
| All other | 208,504 | 87,637 | − 58.0 |
| Total | 8,634,021 | 7,315,491 | − 15.3 |

a Not separately reported.

The table shows clearly the three points already mentioned: First, several of the most important hardwoods are fast being exhausted. Second, the cut has increased in less known and less abundant woods. Maple increased 39.4 per cent and rose to second place in the list. Red gum gained 59 per cent and advanced from seventh to fourth place. Chestnut and birch have increased tremendously, and beech and tupelo have been prominently introduced. Third, although almost all possible new woods have been brought into use there has been a shrinkage in the total output of 15.3 per cent.

### CONDITION AS SHOWN BY STATES.

An examination of the figures for certain States in which hardwood production has centered in the past shows a condition almost startling. Ohio, with a cut of 918 million feet in 1899, had fallen to 433 million in 1906; Indiana, with 976 million feet in 1899, had fallen to 446 million, and Tennessee's 862 million fell to 535 million.

The condition can be realized by a study of Table 2, in which the hardwood cut is given by States for the years 1899 and 1906.

TABLE 2.—*Cut of hardwood lumber, by States, 1899—1906.*

| States and Territories. | 1899. | 1906. | States and Territories. | 1899. | 1906. |
|---|---|---|---|---|---|
| | *Thousand board feet.* | *Thousand board feet.* | | *Thousand board feet.* | *Thousand board feet.* |
| Alabama | 105,491 | 66,409 | New Jersey | 31,871 | 18,665 |
| Arkansas | 444,102 | 528,970 | New York | 207,226 | 279,601 |
| California | 539 | 280 | North Carolina | 145,657 | 227,568 |
| Colorado | 75 | 2,035 | North Dakota | 2,030 | ..... |
| Connecticut | 77,594 | 86,949 | Ohio | 918,231 | 432,802 |
| Delaware | 6,319 | 8,290 | Oklahoma | 6,065 | 1,043 |
| Florida | 2,200 | 2,299 | Oregon | 2,529 | 6,971 |
| Georgia | 42,799 | 47,510 | Pennsylvania | 520,162 | 520,162 |
| Idaho | ..... | 3,383 | Rhode Island | 3,988 | 7,390 |
| Illinois | 250,361 | 127,269 | South Carolina | 17,483 | 18,232 |
| Indiana | 975,779 | 446,448 | South Dakota | 558 | 100 |
| Indian Territory | 9,378 | 20,141 | Tennessee | 861,874 | 535,115 |
| Iowa | 61,028 | 19,451 | Texas | 38,056 | 20,689 |
| Kansas | ..... | 170 | Utah | ..... | 71 |
| Kentucky | 734,386 | 615,256 | Vermont | 50,423 | 103,373 |
| Louisiana | 72,198 | 102,684 | Virginia | 239,860 | 267,196 |
| Maine | 28,730 | 73,156 | Washington | 5,703 | 785 |
| Maryland | 77,581 | 109,523 | West Virginia | 570,208 | 561,588 |
| Massachusetts | 42,147 | 62,270 | Wisconsin | 519,031 | 513,561 |
| Michigan | 811,649 | 783,241 | Wyoming | ..... | 220 |
| Minnesota | 61,956 | 29,071 | Arizona, Nevada, New Mexico | ..... | ..... |
| Mississippi | 207,322 | 286,168 | Nebraska | 14,428 | ..... |
| Missouri | 442,236 | 314,093 | | | |
| Montana | 1,300 | 5,084 | | | |
| New Hampshire | 23,468 | 59,709 | Total | 8,634,021 | 7,315,491 |

This table is convincing as to two things: First, the supply in Indiana and Ohio, the original center of hardwood production, is practically exhausted; second, the cut is now widely distributed and is heavy in every State where there are even small bodies of hardwoods.

Together with Illinois, Ohio and Indiana produced 25 per cent of the hardwood in 1899. In 1906 they produced only 14 per cent. They can never regain their lead, or even maintain the standing they have. Their many wood-using establishments, which are now hard pressed for supplies, will exhaust their remaining remnants within a few years. The land which bore this timber, as fast as it was cleared, was turned to agricultural use, for which most of it is well suited. The improved farm lands of Indiana increased 10.4 per cent between 1890 and 1900; those of Ohio, 4.9 per cent. In both States there is some waste land which will continue in timber and turn out local supplies, but not enough to have any considerable effect on the country's hardwood supply.

States not thought of in former years for their hardwoods are now turning out considerable quantities. Maine, with a cut of 29 million feet in 1899, went to 73 million in 1906; New Hampshire turned out 60 million in 1906 as against 23 million in 1899. Even Oregon, Montana, and other Western States came into the list with unexpected amounts. In all of the States west of the Mississippi Valley the supply is small and can never become much of a factor.

The impressive thing is that we are bringing hardwoods from far and near, and still the cut is going down.

### CONDITIONS IN MAIN REGIONS OF PRODUCTION.

The main production is now in the Lake States, especially Michigan and Wisconsin, the lower Mississippi Valley, and the Appalachian Mountains. What are the conditions in these regions?

### LAKE STATES.

The three Lake States furnished 18 per cent of the hardwood cut in 1906, as against 16 per cent in 1899. This percentage increase does not mean a real increase. On the contrary, every one of the Lake States fell off, though altogether their cut did not decrease in proportion to that of the rest of the country. The figures seem to indicate unmistakably that their maximum production has been reached. If this is true, then their decline in the future is likely to be almost as rapid as that of Ohio and Indiana, because of the nearness of many large hardwood-using industries which will make heavy demands upon the supply. This is now the supply nearest to many of the great plants in Illinois, Indiana, and Ohio.

The hardwoods in the Lake States stand upon good loam soil which, though stony in places, produces the finest of grasses. Where arable, this soil yields good crops of hay and potatoes, and in some localities grain and fruit. So invariably do the hardwoods indicate good soil that they are one of the most common means of land classification. And since hardwood land always means good soil, land from which hardwoods are cut does not revert to the State, as has been frequently the case with pine land, especially in Michigan. The hardwood land is held until it can be sold to farmers who clear it and turn it permanently to agricultural use, for which, as in Ohio and Indiana, it is fundamentally suited.

The southern part of Michigan, which originally bore magnificent hardwoods, was the first part of the State to be cleared, and is now the backbone of Michigan's agriculture. Just as fast as the hardwoods, even in the northern peninsula, are cut the land will be settled for farming. The same is true of Wisconsin and Minnesota. The almost complete exhaustion of their timber supply and the transformation of their hardwood lands into farms are apparently the only results to be expected.

### LOWER MISSISSIPPI VALLEY.

The States of the lower Mississippi Valley, including Missouri, Arkansas, Texas, Louisiana, and Mississippi, produced in 1899

1,203,914 thousand feet, or 14 per cent of the entire output, of hardwood lumber. In 1906 they produced 1,252,604 thousand feet, or 17 per cent of the country's output. The percentage gain, it will be seen, represents a very slight absolute gain. Missouri and Texas declined somewhat, while Arkansas, Mississippi, and Louisiana made considerable increase. The figures indicate that this group of States has nearly, if not quite, reached its maximum cut. In these States, following the rule already noticed, the hardwoods are found on very fertile soil. They center in the lowlands—the river bottoms and the swamps. On account of their great fertility these lands are now desired for farming, and clearing, and even drainage where necessary, are being hastened in order to turn them to the production of cotton, corn, and other crops. An exception, of course, exists in the Ozark Mountains of Missouri and Arkansas, certain portions of which are better adapted to hardwood timber than to other uses. Such areas are relatively small. In the main, those mountains have a climate and a soil which adapt them to fruit growing, for which the Ozark section has already become noted. In common with the whole lower Mississippi Valley, this region must be expected to change largely from a timbered to an agricultural condition.

### APPALACHIAN STATES.

The States which are here considered to form the Appalachian group are as follows: Maine, New Hampshire, Vermont, Massachusetts, New York, Pennsylvania, Maryland, West Virginia, Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, and Alabama. They turned out in 1899, 3,667,495 thousand feet of hardwood, which was 42 per cent of the total cut. In 1906 they produced 3,546,668 thousand feet, or 48 per cent. They thus increased their proportion 6 per cent, although they actually fell off 121 million feet.

While but small parts of several of these States lie in the mountains, it is true of the region as a whole that the bulk of their hardwood timber is now to be found in the mountains. The Appalachian Mountains must have fully half of the country's present supply of hardwood, in spite of the fact that heavy cutting has been going on in them for over a hundred years.

There are two main reasons why this region has borne such heavy cutting and still contains so much of the supply. In the first place, the mountains are nonagricultural. There has been no wholesale tendency to clear them for farming. Profitable farming exists, as a rule, only in the valleys and on the lower slopes. Many sporadic attempts have been made to farm the higher mountains, especially in the Southern Appalachians, but the farms have been small and generally unprofitable. After the pioneers' patience or endurance has been

exhausted the forest has slowly crept back and reclaimed the land, from which it never should have been removed.

In the second place, inaccessibility accounts for the continued forest character of the Appalachian region. With the low prices which prevailed until a few years ago, it did not pay to bring the timber down from the higher mountains. So it was allowed to remain.

While other causes may have had local influence, these conditions in the main account for the fact that the Appalachians have maintained their hardwood production. Nevertheless, some of the Appalachian States have gone back badly. Kentucky and Tennessee show heavy declines. In these States the lumbermen have gone farther and farther into the forest, until, even in the most inaccessible parts, little virgin growth remains.

It is only in the extreme portions of the mountains that the cut has held up or increased. Maine, New Hampshire, and Vermont in the North, and North Carolina in the South, show increased cuts. Not one of these States, however, shows anything like the production that Ohio, Indiana, Kentucky, or Tennessee has shown in the past.

The plain truth is that in the Appalachians, as in the other regions, the hardwood lumbermen are working upon the remnants. The supply is getting short and the end is coming into sight.

### HOW LONG WILL THE SUPPLY LAST?

In view of existing situation, it is important to consider as closely as possible how long the hardwood supply will last. To reach any conclusion on this point we must know, approximately, how much hardwood we are using yearly, and we must know or estimate the available supply.

While we know within reasonably close limits how much hardwood is used for the manufacture of lumber, we do not know how much is cut for other purposes. Enormous quantities are required each year for railroad ties, telephone and other poles, piles, fence posts, and fuel, and a great amount is wasted in lumbering and manufacture. The present lumber cut of 7½ billion feet represents probably not one-third of the hardwoods yearly used. Twenty-five billion feet yearly is certainly not a high estimate.

The amount of standing hardwoods is still more uncertain. There has been no census of standing timber, and there have been but few estimates. The largest estimate sets the figure for hardwoods at 400 billion feet. If we are using hardwoods at the rate of 25 billion feet per year, this would mean a sixteen years' supply. The conditions during the past few years suggest no reason for increasing this estimate. A distinct difference exists between the softwood and the hardwood situation. The supply of softwoods east of the Mississippi

is running low almost as fast as that of hardwoods. Of softwoods, however, a large supply exists on the Pacific coast, which will suffice for a number of years after the eastern supply is exhausted. There is no hardwood supply in the Far West. When the supply in the Central and Eastern States is gone there will be no other source to which to turn.

## ADVANCING PRICES OF HARDWOODS.

Only within the last eight years have prices begun to reflect the dwindling supply, though the immoderate cutting away of this re-

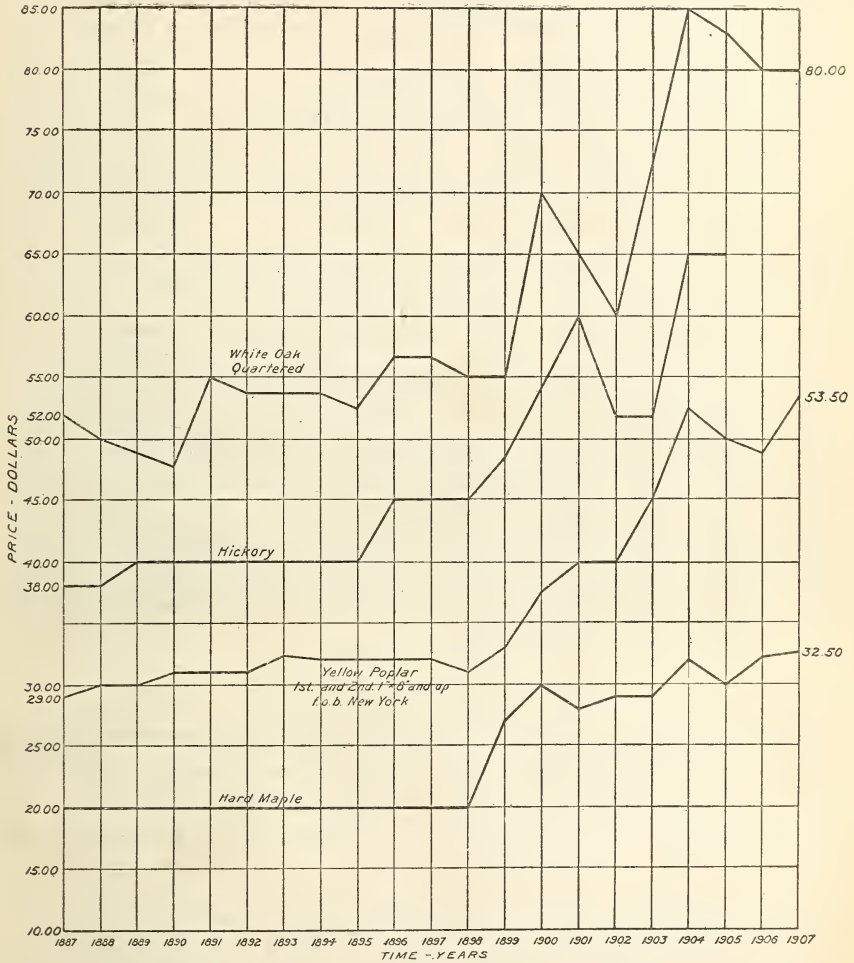


FIG. 1.—Increasing prices of hardwoods, 1887–1907.

source has been going on for decades. The diagram (fig. 1) shows the advance in prices of some of the principal hardwoods during the

past eight years. It also shows the almost steady level of prices previous to 1898.

Considering the impoverished supply and the tremendous demands on the part of all the industries for timber, there is nothing surprising about the increase, which seems not quite to have kept pace with the increasing prices of softwoods. This is rather remarkable in view of the shorter supply, but is probably due to the fact that softwoods, forming the main bulk of the lumber supply, have led in establishing prices.

Along with the increase of prices there has been an almost constant, and an entirely necessary, relaxation of the rules by which lumber is graded and sold. The latest and most significant change is that made by the National Hardwood Lumber Association at its meeting in Atlantic City in May, 1907. Heretofore only even lengths, such as 6, 8, and 10 and 12 feet have been upon the market. The changed rules allow even lengths down to 4 feet and 15 per cent of odd lengths above 4 feet. Smaller standards of thickness are also allowed. Many other equally significant changes are included. It emphasizes the fact that we are down to the rock bottom, and require every sound piece of hardwood lumber that can be put upon the market.

### WHAT INDUSTRIES WOULD A HARDWOOD SHORTAGE AFFECT?

Several great industries use hardwood timber mainly or almost exclusively for their raw material. Notable in this list are hardwood lumber manufacturing, the cooperage, furniture, and vehicle industries, and the industries engaged in the manufacture of musical instruments, coffins, and small wooden ware. All of these would suffer greatly and some would fail entirely upon the exhaustion of the hardwood supply. Other industries, such as the manufacture of agricultural implements, freight and passenger cars, boxes and crates, use immense quantities of hardwood.

### HARDWOOD LUMBER MANUFACTURE.

Hardwood lumber manufacture affords an example of the damage already done. It has been shown how hardwood lumber production in Ohio was cut down over one-half between 1899 and 1906. The decrease in products between 1900 and 1905, according to Census reports, amounted to $7,212,345, or 57.4 per cent, and the rank of the industry in the State fell from the fourth to the twentieth place. The number of employees fell from 10,689 to 6,442, or 40 per cent.

In Indiana during the same period the lumber industry fell from the third to the eighth place; the value of products decreased 27.1 per cent; the number of wage-earners decreased 42.6 per cent, and the wages paid decreased 36.6 per cent.

Lumber manufacturing is the first among the industries to feel the blight of an exhausted timber supply. When the local supply ceases this industry must stop. Most other industries which use hardwoods can go on, bringing their supplies from a distance. Only with the failure of the entire supply are they seriously damaged.

### COOPERAGE.

In much the same way the cooperage industry must be near the forest. Slack cooperage employs a great number of hardwoods and is distributed through many States. Tight cooperage makes use of the best grades of white oak almost exclusively and centers in Kentucky and Tennessee. The pressure of the timber supply is already heavy on this industry. If the oak supply should fail, the tight cooperage industry will largely cease, and some other container for liquids will have to be found to replace wood. As yet little progress has been made in securing substitutes for the oak cask and barrel.

### FURNITURE MAKING.

The manufacture of furniture probably calls for more hardwood than any other industry, and employs hardwood almost exclusively as raw material. In 1905 there were 2,482 furniture establishments in the United States, with a capital of $153,000,000 and an annual product valued at $170,000,000. In reports made to the Forest Service 538 of these establishments reported the annual use of 580 million feet of lumber. It seems probable that the industry requires upward of 20 per cent of the entire hardwood production. The public is so much accustomed to hardwood furniture that furniture of any other material would not be acceptable. Failure of the hardwood supply would doubtless terminate the furniture industry as it is now carried on.

### MUSICAL INSTRUMENTS.

As in furniture, hardwood is the chief material in the manufacture of musical instruments, especially pianos and organs. Maple, poplar, elm, oak, chestnut, and basswood are most largely used. Foreign woods are used only for veneers, for which purpose large quantities are not required.

### VEHICLE MANUFACTURE.

In 1905 there were in the United States 5,143 establishments for the manufacture of vehicles, with a capital of $149,000,000 and a yearly product of $155,000,000. No industry stands in a more threatened position, so far as supply is concerned, than the manufacture of wagons and carriages. It requires the best hardwoods, and even now these are obtained with extreme difficulty. Hickory and oak are

used in the largest quantities, and vehicle manufacturers believe that the hickory supply of the country can not last over ten years longer. Attempts to substitute other woods or other materials for hickory in vehicle manufacture have largely failed. The vehicle industry, like the furniture industry, can not exist on its present basis without hardwood timber.

AGRICULTURAL IMPLEMENTS.

Metal has to some extent taken the place of wood in farm implements, but surprisingly large quantities of hardwood are still used. Recent reports from 167 manufacturers show the use of 212,613,000 feet of lumber annually, by far the larger part of which is hardwood. Since in 1905 there were 648 manufacturing establishments in the United States, the quantity used must really be very great. Hardwood will undoubtedly be used in this industry as long as it is available.

CAR BUILDING.

Car building has required, and still requires, an enormous amount of hardwood material. Though steel is being employed more largely than in the past in the construction of both freight and passenger cars, the great majority of both classes of cars are still made of wood and the specifications of the railroads indicate that much of the timber used is hardwood.

RAILROAD TIES.

Hardwoods have been, and still are, most essential for railroad ties. Half of the hundred million ties used yearly are of hardwood. Hundreds of patents exist for ties of other material. None has commended itself to railroads as a general substitute for the wooden tie. Very large quantities of hardwood are likewise used for bridges and trestlework.

TELEPHONE AND OTHER POLES.

The pole lines of the country have also called for a great deal of hardwood timber. Every year the demand is increasing. No other material has proved satisfactory for the support of the network of wires which now binds together every part of the country.

HOUSE FINISHING.

House finishing, including interior woodwork, doors, window sashes, stair work, and mantels consumes each year a great deal of hardwood. For durability and acceptability hardwood finds here one of its most desirable uses. In well-built houses in many parts of the country hardwood finishing is almost as commonly found as is hardwood furniture.

WHAT STATES WOULD BE MOST AFFECTED.

Below is given a tabular statement showing the rank of the most important States in the leading hardwood industries, as shown by the census reports. The rank is based upon value of products, except in lumber manufacturing, where it is based on quantity of product.

TABLE 3.—*Rank of most important States in hardwood industries.*

| Industry. | Illinois. | Indiana. | Ohio. | New York. | Michigan. | Pennsylvania. |
|---|---|---|---|---|---|---|
| Lumber manufacture (census 1900)[a] | ..... | 1 | 2 | ..... | 4 | ..... |
| Planing mills | 3 | ..... | 4 | 1 | 5 | 2 |
| Agricultural implements | 1 | 6 | 3 | 2 | 5 | ..... |
| Carriages and wagons | 5 | 2 | 1 | 3 | 4 | ..... |
| Furniture | 2 | 4 | 5 | 1 | 3 | ..... |
| Car building | 1 | 4 | ..... | ..... | 3 | 2 |
| Musical instruments | 2 | ..... | ..... | 1 | ..... | ..... |

[a] The census of 1900 is used in order to show the rank of Indiana and Ohio before their timber supply declined.

The statement shows how substantially the hardwood industries center in the States of Illinois, Indiana, Ohio, Michigan, and New York. Of these only Michigan and New York have now any considerable hardwood supply of their own. Illinois, Indiana, and Ohio are dependent upon the Lake States, the lower Mississippi Valley States, and the Appalachian States.

The main consideration, however, is that if the hardwood timber supply were to be speedily exhausted the great industries which now depend upon it would be severely crippled or ruined. To consider how important these are, take, for instance, the State of Illinois. Though Illinois is not known as an important hardwood State, Table 3 shows it to be second only to New York in hardwood manufacturing industries. In these industries Illinois has invested, according to the census of 1905, a capital of $148,115,805—almost one-fifth of the total capital invested in manufacturing. It employs 59,844 wage-earners, and it turned out, in 1905, a product valued at $139,970,590, or 12 per cent of the total value of manufactured products.

Exhaustion of the hardwood supply assuredly means the loss of these industries to the States in which they are at present located, just as Ohio and Indiana have already lost the main part of their hardwood lumber manufacturing. Such industries can not exist after their supply of raw material is gone.

SITUATION CONCERNS ENTIRE COUNTRY.

How intensely the whole country would feel the loss of its hardwood timber, to an ample supply of which it has long been accustomed, can scarcely be realized. Without hardwood for building purposes, for railroad ties, for the manufacture of furniture, cooperage, and vehicles, and for the varied other uses to which it is put, we should be in sad straits indeed. A general failure in crops may

affect industrial conditions for a few years—a failure in the hardwood supply would be a blight upon our industries through more than a generation.

The situation in brief is this: We have apparently about a fifteen years' supply of hardwood lumber now ready to cut. Of the four great hardwood regions, the Ohio Valley States have been almost completely turned into agricultural States, and the Lake States and the Lower Mississippi Valley are rapidly following their example.

In the Appalachian Mountains we have extensive hardwood lands which have been culled and greatly damaged by fire. These are practically all in private hands, and while they contain a large amount of inferior young timber, they are receiving little or no protection, and even such young timber as exists is making but slight growth. Even if these cut-over lands be rightly managed they can not greatly increase their yield of merchantable timber inside of from thirty to forty years.

The inevitable conclusion is that there are lean years close ahead in the use of hardwood timber. There is sure to be a gap between the supply which exists and the supply which will have to be provided. How large that gap will be depends upon how soon and how effectively we begin to make provision for the future supply. The present indications are that in spite of the best we can do there will be a shortage of hardwoods running through at least fifteen years. How acute that shortage may become and how serious a check it will put upon the industries concerned can not now be foretold. That it will strike at the very foundation of some of the country's most important industries is unquestionable. This much is true beyond doubt, that we are dangerously near a hardwood famine and have made no provision against it.

## THE SOLUTION.

If it is true that the hardwood supply is approaching a condition of shortage which would paralyze many of the great industries and gravely affect the entire country, then it is important to seek diligently the best means to avert it, or if that is not wholly possible, to reduce its injuries to the minimum.

The belief is common that the substitution of softwood, metal, and concrete for hardwood will gradually take place as the supply of the latter is reduced. Already the substitution of metal has made much progress. It has replaced hardwood to a considerable extent in the manufacture of implements, furniture, and cars, and even in the interior finish of office buildings and in general construction work. Concrete has also come into wide use in construction. Yet, prominent as these materials have become, they seem not to have reduced the demand for hardwood, which, besides being retained for the greater number of its original uses, has also found new ones. There

is not now much tendency for softwoods to replace hardwoods, and there is not likely to be, because they have not the strength or other properties to make them acceptable as substitutes. The replacement of hardwood by other materials is to be welcomed where those materials make for better service and cheaper cost. Where they will not, and experience thus far shows this list to be a large one, the problem of a hardwood shortage must be solved in another way.

There seems to be but one practicable solution, and that is to maintain permanently under a proper system of forestry a sufficient area of hardwood land to produce by growth a large proportion of the hardwood timber which the nation requires.

Where is this land to be found? Not in the Ohio Valley, the Lake States, or the Mississippi Valley, for the reasons already given. It is to be found in the Appalachian Mountains. These mountains increased their proportion in the nation's hardwood output from 42 to 48 per cent during the past seven years. On the principle of using the land for its highest purpose they should further increase their proportion to not less than 75 per cent. Other sections of the country will readily furnish the remaining 25 per cent.

### APPALACHIANS THE KEY TO THE SITUATION.

The mountain ranges from Maine to Alabama should be made to produce the greater part of the hardwood supply, because growing hardwood timber is their most profitable use. There is, in fact, no other use to which the surface of these mountains can permanently be put. That they can not be successfully farmed has been proved in thousands of cases. For the most part they can not even be permanently grazed.

It is in the production of timber that they excel. They bear the greatest variety of species and the best remaining hardwood growth anywhere to be found. Freed from their enemies—fire and unwise cutting—their forests readily reproduce the best kinds of timber. Outside of local areas of the Pacific coast nowhere else is forest growth so rapid. Even land cleared and farmed to the complete exhaustion of its soil will in this region in time reclothe itself with forests, if only it is protected.

Field estimates by counties show that south of Pennsylvania there are in the Appalachians 58 million acres of forest land, practically all of which is covered by hardwood and over 85 per cent of which is in a cut-over or culled condition. Including the mountains of Pennsylvania, New York, and New England it is probably safe to estimate that the entire Appalachian area includes as much as 75 million acres primarily adapted for hardwood timber. Only a very small part of this is still in virgin growth. By far the great part of it has been cut over, and some of it has been cleared.

Well managed and protected from fire, this area has enormous producing powers. Studies by the Forest Service of average virgin and cut-over lands in eastern Tennessee show that under protection these lands are capable of producing 50 cubic feet of wood per acre annually. Even taking the production as 40 cubic feet, this means for the area of 75 million acres a possible annual production of 3 billion cubic feet.

How does this compare with the annual requirements? The 25 billion feet, board measure, used annually (allowing a product of 8 feet B. M. for each cubic foot, which is believed to be not too high under present utilization) represents a little over 3 billion cubic feet. This is just about equal to the amount which the Appalachian forest is capable of producing. When it is remembered that the Appalachians will probably not be called upon to furnish more than three-fourths of the total supply, it is clear that there is a good margin of safety. Therefore, if the Appalachian forests are rightly managed and taken soon enough, they will insure continuously the hardwood supply of the country, and do it without exhausting the forest. In fact, it can be done so that the systematic treatment will at the same time improve the forest.

Our experience will doubtless be the same in this respect as that of Germany.[a] In Saxony the cut, which represents only the growth, increased during the period from 1820 to 1904 55 per cent, bringing the annual yield to 93 cubic feet per acre. Prussia shows a still more pronounced increase. In 1830 the cut was only 20 cubic feet per acre, and in 1865 had increased to only 24 cubic feet. But in 1890, owing to proper management, it had risen to 52, and in 1904 to 65 cubic feet. These results came largely from nonagricultural lands, sandy plains, swamps, and rough mountain slopes, and from forests which had been mismanaged, much the same as ours.

Much of the Appalachian forest has been so damaged that years will be required for it to reach again a high state of productiveness. Its present average production is probably not over 10 cubic feet per acre per year. The increase would of course be gradual and it would be slow at first. It would be some time before it could average the 40 cubic feet per acre used in the above estimate. Until it does we can expect a shortage in hardwood timber. The longer the delay in putting this forest under control, the longer continued and more extreme will be the shortage.

Approved:

JAMES WILSON,
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[a] From article by Dr. B. E. Fernow, Forestry and Irrigation, February, 1907.